PATENT SPECIFICATION

(11) 1 451 165

1 451 165

(21) Application No. 2052/74 (22) Filed 16 Jan. 1974
(31) Convention Application No. 7 300 729
(32) Filed 19 Jan. 1973 in
(33) Sweden (SW)
(44) Complete Specification published 29 Sept. 1976
(51) INT CL² H02K 7/106
(52) Index at acceptance H2A 15B 16P 16U 16X 4J

(19)

(54) AN ELECTRIC MOTOR HAVING A STATOR, A ROTOR, AND A BRAKING DEVICE

(71) We, AKTIEBOLAGET ELECTROLUX, a Swedish joint stock company, of Luxbacken 1, S—105 45 Stockholm, Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an electric motor having a stator, a rotor and braking device.

In some known motors braking is by means of an electro-mechanical braking device comprising a disc mounted on the rotor shaft and coacting with a disc having brake linings, and an electromagnet. When the motor driving current is switched on, the electromagnet pulls the discs, which are spring-loaded, apart to allow the rotor to rotate freely. When the current is switched off, the electromagnetic force ceases and braking begins. Such braking devices are expensive and take up too much space.

In other known motors the stator is divided into two parts, one of which is movable and has brake linings, which under the influence of a spring force may engage with the rotor surface. Reference is made in this connection to German Patents Nos. 847,933 and 853,307. However, braking devices as shown in these German patents can only be used with horse-shoe-shaped stators. Further, it is sufficient to fix the whole movable part of the stator with sufficient accuracy, the movable part, during operation of the motor, forming part of the air gap between the stator poles and the rotor surface. Only very careful manufacture can give a sufficiently uniform air gap, which increases the manufacturing cost of the braking device.

The purpose of the present invention is to provide an electric motor which has a braking device with few movable and other parts, and in which the air gap between the rotor and the pole pieces of the stator core is not changed when the braking device is being used.

According to the invention there is provided an electric motor having a stator, a rotor and a braking device, the stator including a core with at least two pole pieces, wherein a portion of a braking device is disposed in a space between adjacent pole pieces, the braking device including at least a part which is of magnetizable material and which is received within a core cut-out disposed radially outward of the space, the arrangement being such that magnetic flux in the core will urge the braking device away from the rotor.

The invention will now be described by way of example, with reference to the drawings, in which:—

Figure 1 is a sketch of an electric motor in accordance with the invention;

Figure 2 is a schematic section of part of the motor;

Figure 3 is an axial section of the motor of Figure 2; and

Figure 4 is an axial section of another embodiment of the motor of the invention.

In Figure 1 there is schematically shown a motor comprising a rotor 10, a rotor shaft 11, and a stator core 12. For simplicity, a motor with only two pole pieces 13, 14 has been shown.

The stator core 12, preferably of laminated iron, has a cut-out 15 disposed as shown radially outward of a space 19 between the adjacent pole pieces. The cut-out is of V-shape, but it can be of another shape as required. As outlined in dash lines the stator core can have another cut-out 16. In a motor having several pole pieces, such cut-outs can be arranged in all the spaces between adjacent pole pieces. Due to the cut-outs 15, 16 portions of reduced thickness 17, 18, are formed in the stator core.

In the space 19 is a portion of a brake device which has a part 23 which is of magnetizable material non-fixedly received

as shown within a cut-out 15 in the stator core. The brake device has a braking surface 21 facing the rotor surface 20 and provided with a brake-lining, and the brake device can move in the space 19. When the motor is not in use, the braking device 21 is pressed against the surface 20 by a spring 22 and thus away from the cut-out 15. When the motor current is switched on, a magnetic flux arises in the stator core 12. At a low value of that flux, the portion of reduced thickness 17 becomes saturated, so that the greater part of the flux is forced through the brake device part 23 which is disposed in the cut-out 15 and which is of magnetizable material; it may, for instance, be a laminated iron core. Under the influence of the magnetic flux, the brake device part 23 will be drawn into the cut-out 15 against the spring 22 so that the rotor can rotate freely.

On switching off the motor current, the flux in the stator core 12 and the part 23 will collapse, so that the braking surface 21 will again be pressed by the spring 22 against the rotor surface 20 to stop the rotor.

As will be apparent, the air gaps of the motor between the pole pieces 13 and 14 and the rotor 10 are not affected by the brake device. No shafts or other suspension attachments are required for the brake means. In order to avoid disturbance of the magnetic circuit, the inner part 24 of the brake device is of a non-magnetizable material, e.g. plastics.

In the embodiment shown in Figures 2 and 3 the motor comprises the parts discussed above. In Figure 2 a stator winding 25 is shown. In Figures 2 and 3 are also shown parts of the motor casing 26. The brake device comprises a laminated iron core 27 and two brake blocks 28. These parts are secured to each other by a through bolt 29, washers 30 and a nut 31. The part of each brake block facing the rotor surface 20 has a brake lining 32.

The brake blocks 28 are of a light material, e.g. plastics. Further to reduce the weight of the blocks, they are formed with recesses 33.

The brake device can move freely between the cut-out 15 and the rotor surface 20 under the influence of the magnetic flux in the stator core and the force of the springs 22, of which there are four, guided by guide pins 34. These pins can be secured either to the motor casing 26 or directly to the brake device.

The brake device must not move freely in the axial direction of the rotor and the brake blocks 28 therefore have flanges 35 positioned on respective sides of the stator core and gripping it, by virtue of the bolt 29 and nut 31.

The embodiment shown in Figure 4 is like that of Figures 2 and 3 except that the brake blocks 28 do not have brake linings, and are instead formed wholly of brake material which has a braking surface 36. Thus, another working step is saved in manufacture of the brake device, which can make it both cheaper and more reliable.

For clarity, the gaps between the rotor surface 20 and the braking surfaces are shown as being comparatively wide. In practice each gap is of the order of a few tenths of a millimetre. For this reason tilting of the brake device during braking will be insignificant and will be virtually without effect. Thus, separate guiding means for the brake device is not needed, although in other embodiments such guiding means can be used.

WHAT WE CLAIM IS:—

1. An electric motor having a stator, a rotor and a braking device, the stator including a core with at least two pole pieces, wherein a portion of a braking device is disposed in a space between adjacent pole pieces, the braking device including at least a part which is of magnetizable material and which is received within a core cut-out disposed radially outward of the space, the arrangement being such that magnetic flux in the core will urge the braking device away from the rotor.

2. A motor according to claim 1, wherein one or more than one spring urges the braking device towards the rotor.

3. A motor according to claim 1 or claim 2, wherein the core cut-out provides a core portion of reduced thickness in the radial direction.

4. A motor according to any preceding claim, wherein the said at least a part of the braking device is loosely received in the core cut-out.

5. A motor according to any preceding claim having one part of magnetizable material and another part of non-magnetizable material.

6. A motor according to claim 5 wherein the said other part is of plastics.

7. A motor according to any preceding claim, wherein the braking device has one or more than one brake lining.

8. A motor according to claim 5, wherein the said other part is of brake material.

9. A motor according to any preceding claim, wherein the braking device has flanges at respective sides of the stator core to limit axial movement of the braking device.

10. An electric motor constructed and arranged substantially as herein described and shown in the accompanying drawings.

WITHERS & ROGERS
Chartered Patent Agents,
148—150 Holborn,
London, EC1N 2NT
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1976.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1451165 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

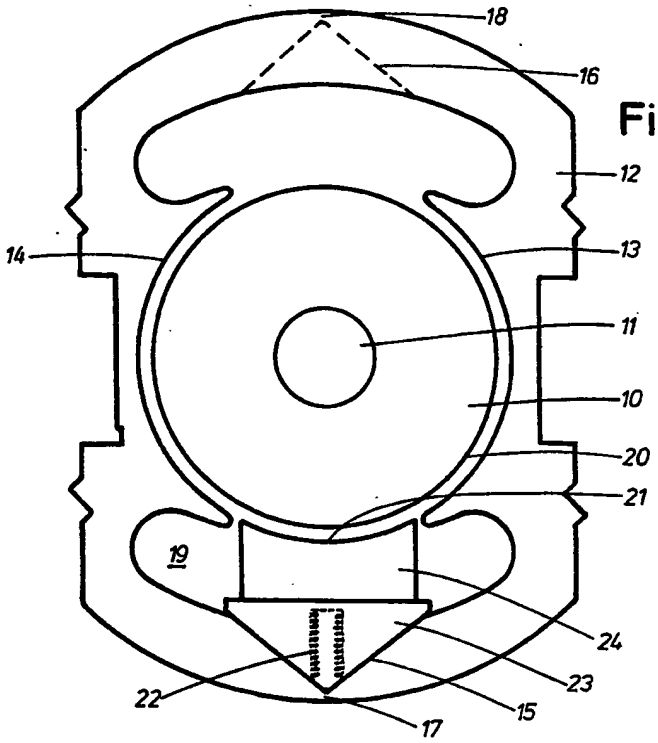

Fig.1

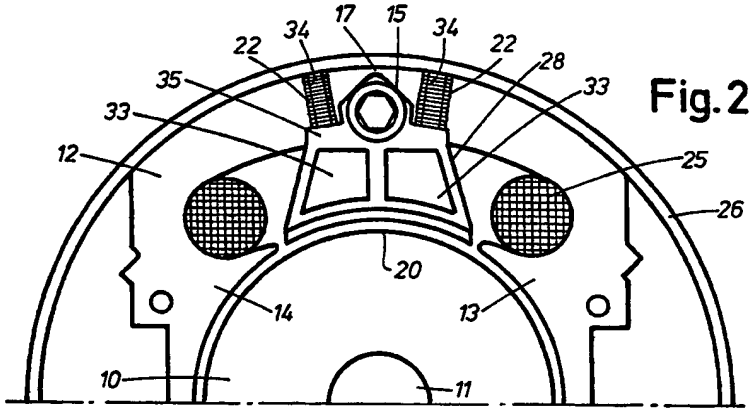

Fig.2

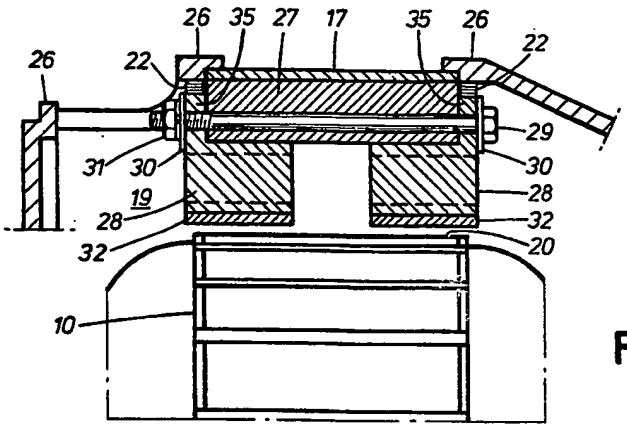
26
35
27
17
35
26
22
26
22
29
31
30
30
19
28
28
32
32
20
10

Fig. 3

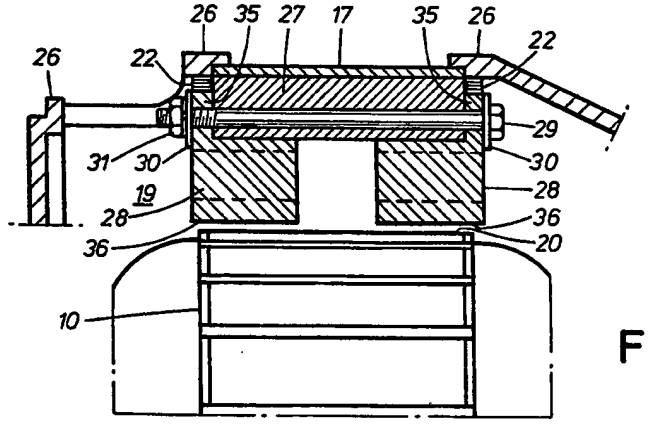
26
35
27
17
35
26
22
26
22
29
31
30
30
19
28
28
36
36
20
10

Fig. 4